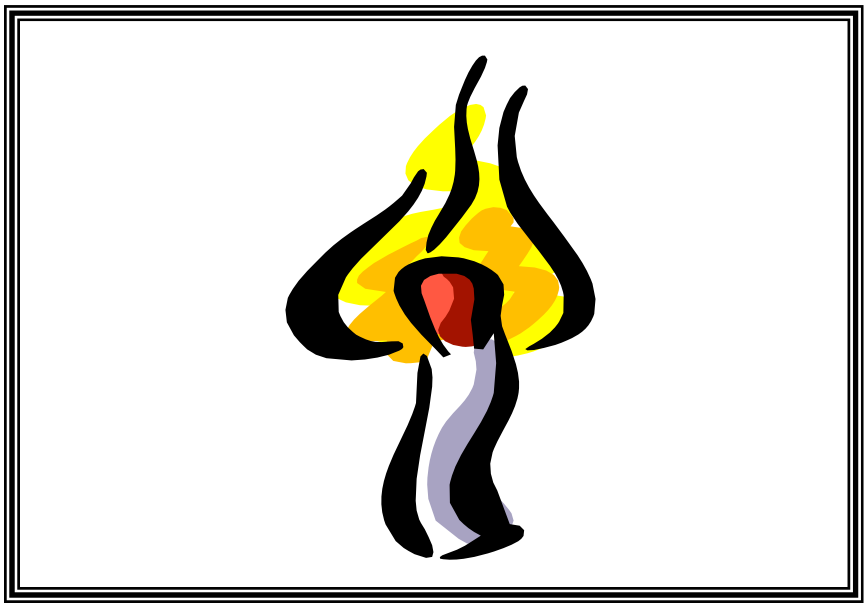
Properties of Matter
Physical and Chemical Change
Promotion Benchmark 5 Lesson Review
Student Copy



Vocabulary

Physical change – A change in the size, shape, color, or state of matter of a substance. No new substance is produced.

Chemical change – The change of substances into different substances. The production of a new substance may be signaled by a change in color or odor, appearance of bubbles (gas), release of energy (light, sound, or heat), or formation of a precipitate.

Review for Promotion Benchmark 5:
Differentiates between a physical and a chemical change; applies the Law of Conservation of Mass

Law of Conservation of Mass – Matter is neither created nor destroyed in a chemical reaction.

Reactants – The substances mixed together to produce a chemical reaction.

Products – The new substance(s) produced as a result of a chemical reaction.

Things around us are constantly changing. One minute the sun may be brightly shining. In the next minute, the sky darkens, and the sun disappears from sight when a cloud blocks its rays. Since the world around us is made of matter, it, too, is constantly undergoing change. Sometimes there is just a change in the way the matter looks; at other times, there is a change in the composition of the matter itself.

Scientists divide the changes in matter into two categories: **physical changes** and **chemical changes**. A **physical change** is a change in the appearance or physical properties of a substance. A physical change *does not produce a new substance*. For example, tearing a piece of paper in half is a physical change. Although the paper is smaller, it is still paper. Some other examples of physical changes are listed on the following page.

- A grape when stepped on (changes shape)
- Blowing up a balloon (changes size and shape)
- Liquid water turning to ice (changes state of matter)
- Liquid water turning to steam (changes state of matter)
- Mixing salt and sugar (changes the appearance, but you can still separate the mixture)
- Mixing water and salt (changes the appearance, but you can still separate the mixture)

A **chemical change** is a change that *makes a new substance*. Suppose that you take the same piece of paper you tore in half and throw it into a fireplace. The burning of paper is a chemical change. The ashes left over by the burning process no longer look and feel like the original paper because it has been chemically changed into different substances that have different properties.

How will you know if a new substance has been produced? Some of the common signs that a chemical change has occurred are:

1. Production of gas bubbles
2. Change in the way something smells
3. A release of energy such as a flash or a sound (like a firecracker)
4. A precipitate forms (two liquids mixed together form a solid and a liquid)

Here are some examples of chemical changes:

- Metal rusting (new substance formed)
- Stomach digesting food (break down of food to new substances)
- Plant carrying out photosynthesis (putting water and carbon dioxide together to make sugar)
- Mixing baking soda and vinegar (makes a neutral liquid and a gas)

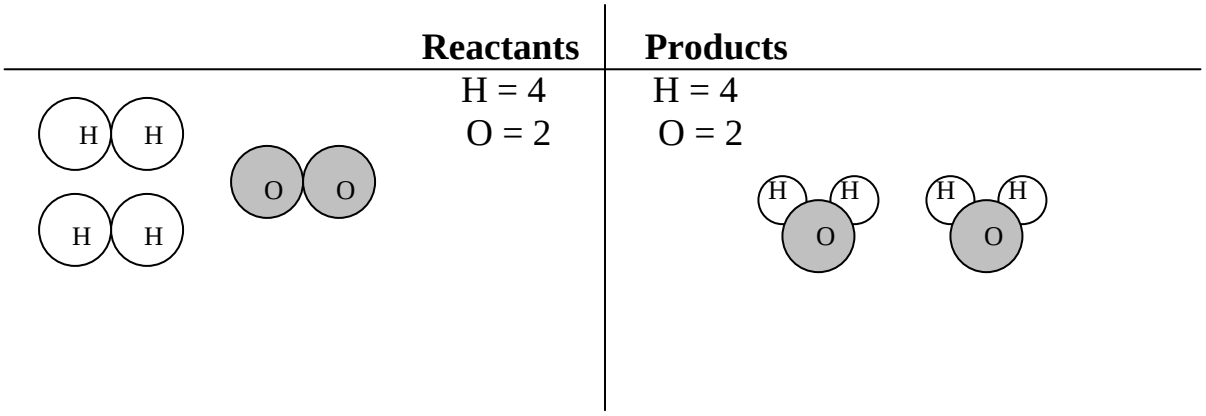
In a chemical reaction, matter can change from one substance into another substance; however, the amount of matter used in the reaction does not change. This is a statement of the **Law of Conservation of Mass.** In other words, when a chemical reaction occurs, something new is formed. Although something new is formed, there will still be the same amount of matter in the new substance as there was in the substances used to produce the reaction. In a chemical reaction, the substances used to produce the reaction are called **reactants**. The substances produced by the reaction are called **products**. Therefore, according to the **Law of Conservation of Mass**, you must have the same amount of matter present in the products that you did in the reactants.

Let's take a look at an example.

$$2H_2 + O_2 \rightarrow 2H_2O$$

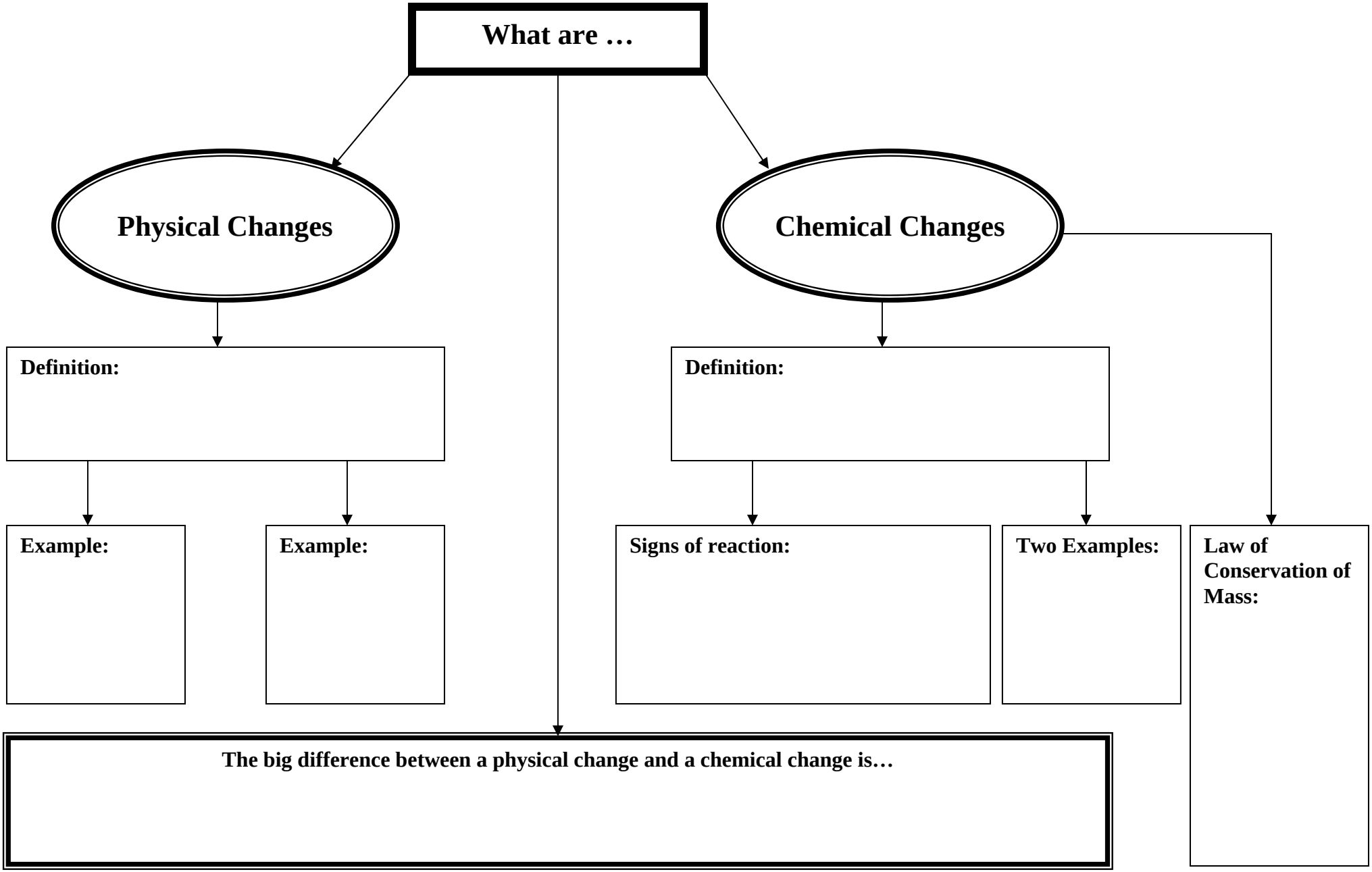
(hydrogen gas) + (oxygen gas) → (water)

From the chemical equation we see that two molecules of hydrogen gas added to one molecule of oxygen gas produce two molecules of water. It is useful to use a T-chart to count the number of atoms involved on each side of the reaction.



Using the T-chart, we find that there are four atoms of hydrogen and two atoms of oxygen in both the reactants and the products. Each time you write a chemical equation, the Law of Conservation of Mass requires us to check the number of atoms of reactants to make sure they are in balance with the number of atoms in the products.

In summary, the most important point to remember about physical and chemical changes is that a chemical change produces new substances, and a physical change does not. When a chemical change occurs, new substances are produced, but the amount of matter used in the reaction stays the same.


What are …
Physical Changes
Chemical Changes
Definition:
Definition:
Example:
Example:
Signs of reaction:
Two Examples:
Law of Conservation of Mass:
The big difference between a physical change and a chemical change is…

Review for Promotion Benchmark 5

Directions: Tell whether each of the following is a **chemical change** or a **physical change**.

1. Mixing salt and pepper _____
2. Cutting an apple in half _____
3. Burning paper _____
4. Rusting iron _____
5. Breaking glass _____
6. Toasting a marshmallow _____

Directions: In the spaces below, write **T** if the sentence is true and **F** if the sentence is false.

7. _____ A chemical change makes new substances.
8. _____ A physical change makes new substances.
9. _____ The boiling of water is an example of a chemical change.
10. _____ The freezing of water is an example of a physical change.
11. _____ Demolishing a car is an example of a physical change.
12. _____ The shredding of paper is a chemical change.

Directions: For the following questions, circle the correct answer.

1) In a chemical equation, you have 3 atoms of chlorine in the reactants. How many atoms of chlorine would you have in the products?

   a) 4 b) 6 c) 9 d) 3

2) Katie determined the mass of her candy bar to be 27g. She took it out of the wrapper and found the mass of the wrapper and candy bar separately. If the mass of the candy bar was 23g, what would the mass of the wrapper be?

   a) 27g b) 23g c) 7g d) 4g

3) Suzie found the mass of her orange juice and vitamin separately. If she crushed her vitamin and dropped it into her OJ, what should the mass be?

   a) Less than that of the vitamin and OJ separately
   b) More than that of the vitamin and OJ separately
   c) Equal to the mass of the vitamin and OJ separately

4) What does the Law of Conservation of Mass state?

   a) Matter cannot be created, only destroyed
   b) Matter cannot be created or destroyed, it only changes form
   c) Matter cannot be destroyed, only created